Figures

20200402000

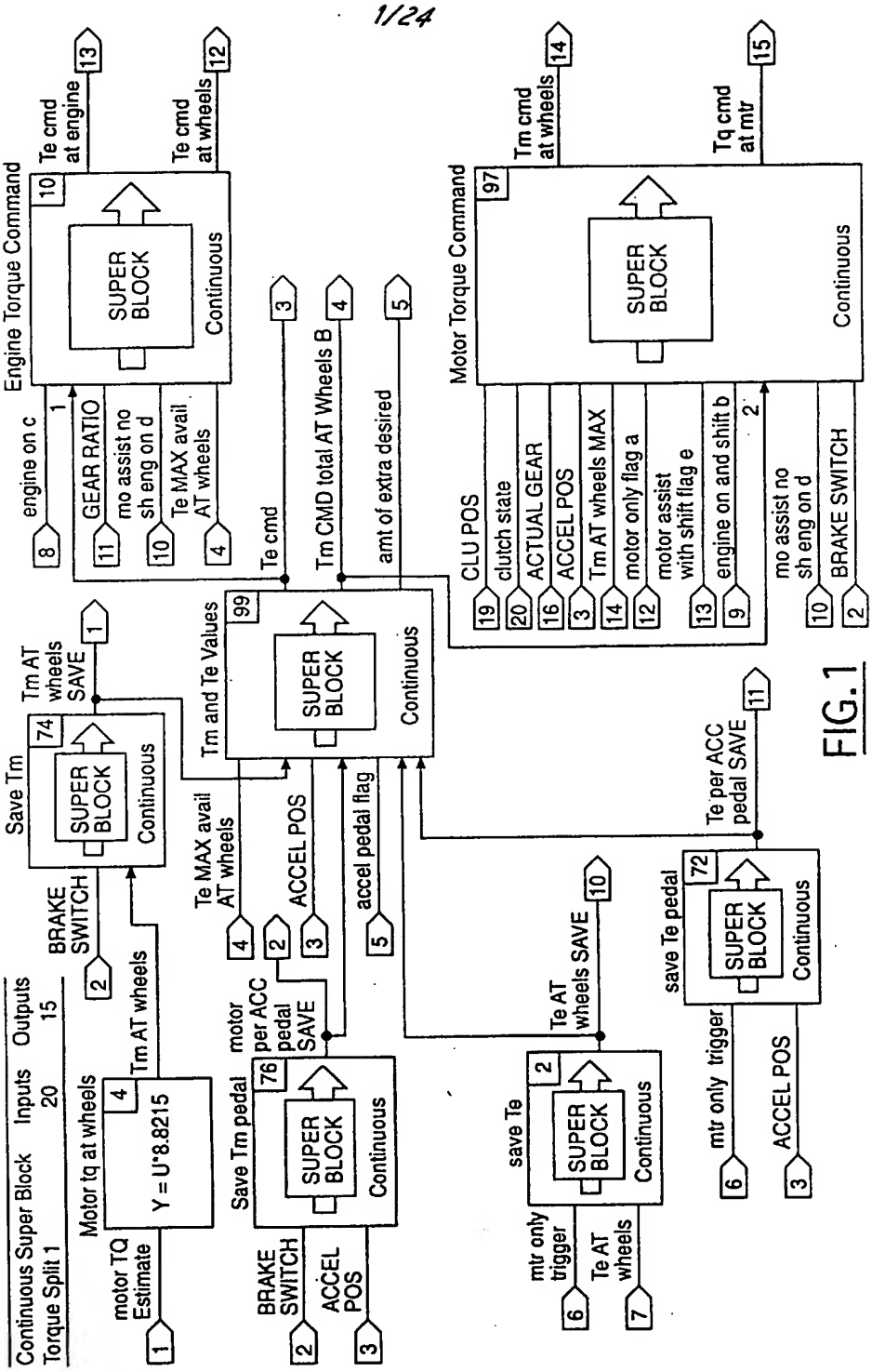
Continuous Super Block
Torque Split 1
Inputs 20
Outputs 15
Motor tq at wheels
Y = U*8.8215
motor TQ Estimate
Tm AT wheels
BRAKE SWITCH
Save Tm
SUPER BLOCK
Continuous
Tm AT wheels SAVE
Engine Torque Command
engine on c
GEAR RATIO
mo assist no sh eng on d
Te MAX avail AT wheels
Te cmd at engine
Te cmd at wheels
Te cmd
Tm CMD total AT Wheels B
amt of extra desired
Tm and Te Values
ACCEL POS
accel pedal flag
Te MAX avail AT wheels
Save Tm pedal
motor per ACC pedal SAVE
BRAKE SWITCH
ACCEL POS
save Te
Te AT wheels SAVE
mtr only trigger
Te AT wheels
Motor Torque Command
CLU POS
clutch state
ACTUAL GEAR
ACCEL POS
Tm AT wheels MAX
motor only flag a
motor assist with shift flag e
engine on and shift b
mo assist no sh eng on d
BRAKE SWITCH
Tm cmd at wheels
Tq cmd at mtr
Te per ACC pedal SAVE
save Te pedal
mtr only trigger
ACCEL POS

FIG. 1

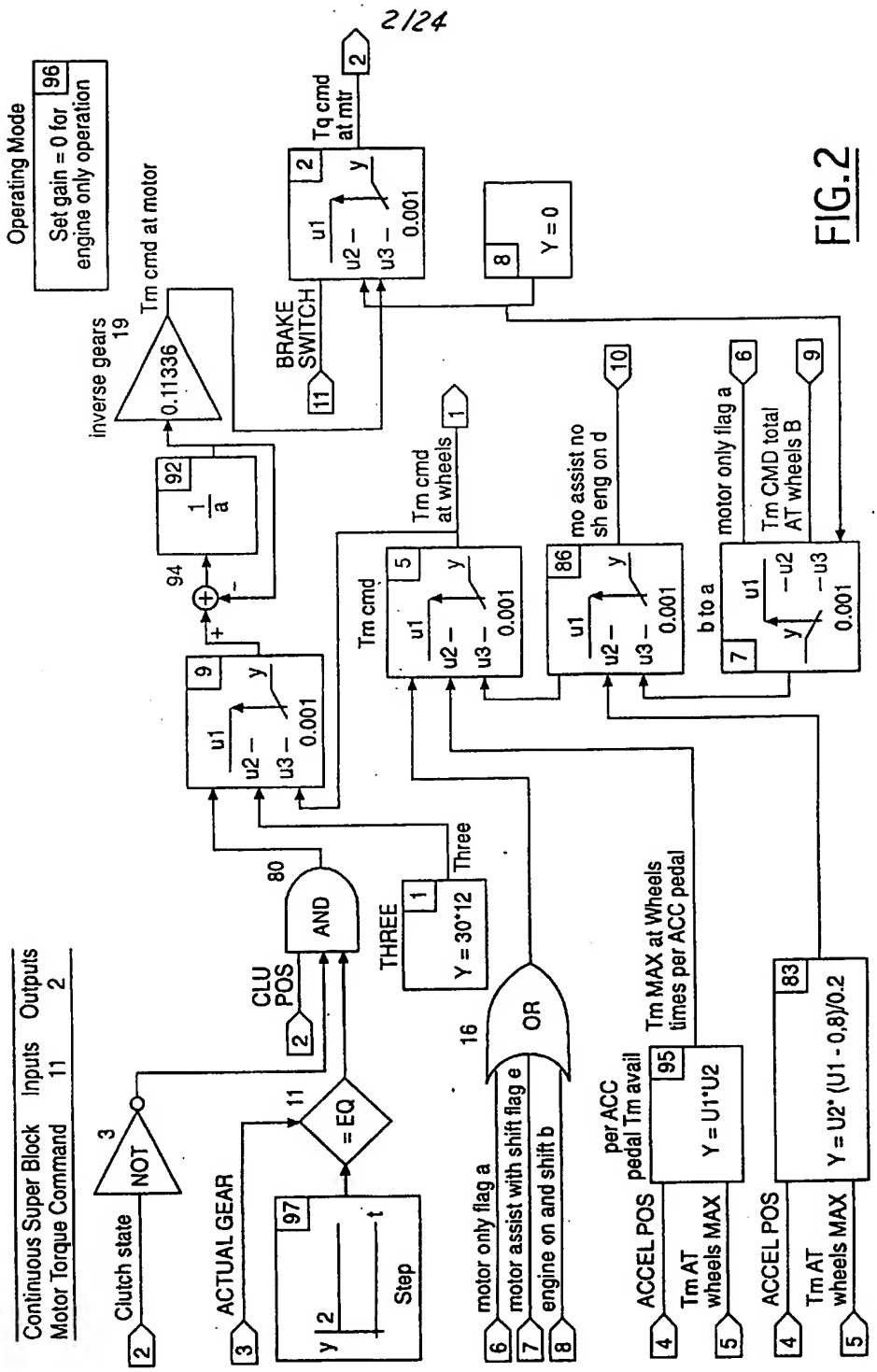
Continuous Super Block Inputs 11 Outputs 2
Motor Torque Command
Clutch state
NOT
ACTUAL GEAR
= EQ
Step
CLU POS
AND
THREE
Y = 30*12
Three
motor only flag a
motor assist with shift flag e
engine on and shift b
OR
ACCEL POS
Tm AT wheels MAX
Y = U1*U2
per ACC pedal Tm avail
Tm MAX at Wheels times per ACC pedal
ACCEL POS
Tm AT wheels MAX
Y = U2* (U1 - 0,8)/0.2
Operating Mode
Set gain = 0 for engine only operation
inverse gears
0.11336
Tm cmd at motor
BRAKE SWITCH
Tq cmd at mtr
Y = 0
Tm cmd
Tm cmd at wheels
mo assist no sh eng on d
b to a
motor only flag a
Tm CMD total AT wheels B
0.001

FIG.2

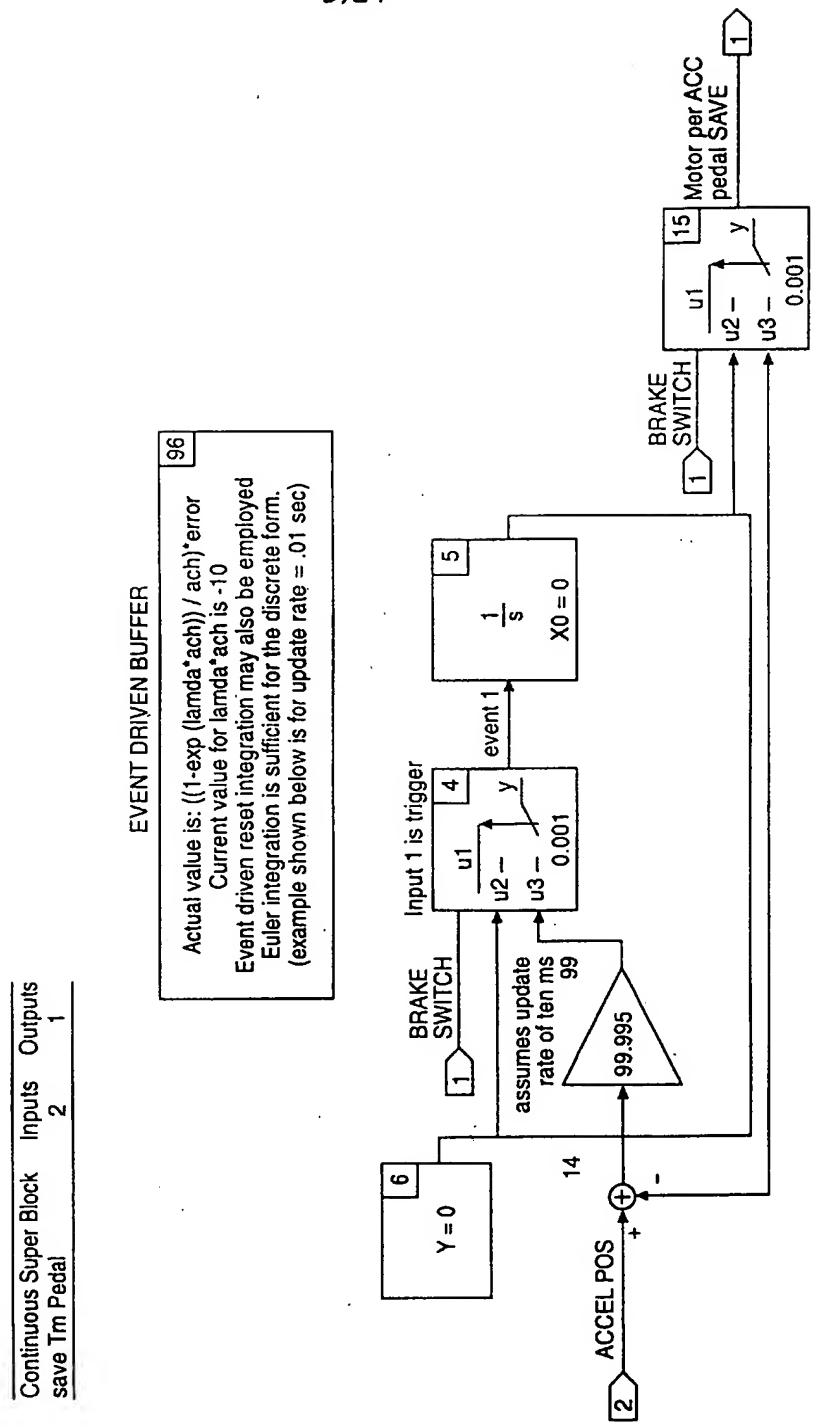
Continuous Super Block save Tm Pedal
Inputs 2
Outputs 1
EVENT DRIVEN BUFFER
96
Actual value is: ((1-exp (lamda*ach)) / ach)*error
Current value for lamda*ach is -10
Event driven reset integration may also be employed
Euler integration is sufficient for the discrete form.
(example shown below is for update rate = .01 sec)
6
Y = 0
BRAKE SWITCH
1
Input 1 is trigger
4
u1
u2 –
u3 –
y
0.001
event 1
5
1/s
X0 = 0
assumes update rate of ten ms
99
99.995
14
ACCEL POS
2
BRAKE SWITCH
1
15
u1
u2 –
u3 –
y
0.001
Motor per ACC pedal SAVE
1

FIG.3

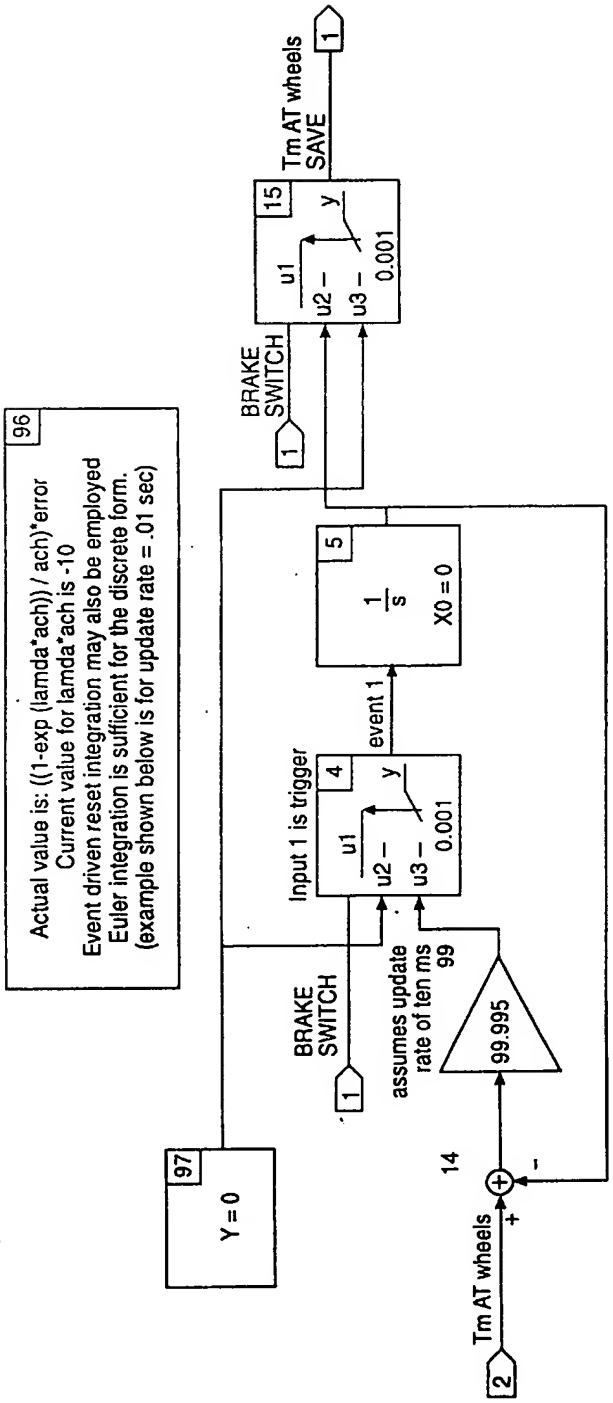
EVENT DRIVEN BUFFER
96
Actual value is: ((1-exp (lamda*ach)) / ach)*error
Current value for lamda*ach is -10
Event driven reset integration may also be employed
Euler integration is sufficient for the discrete form.
(example shown below is for update rate = .01 sec)
BRAKE SWITCH
1
15
u1
u2 –
u3 –
y
0.001
Tm AT wheels SAVE
1
5
1/s
X0 = 0
event 1
Input 1 is trigger
4
u1
u2 –
u3 –
y
0.001
BRAKE SWITCH
1
assumes update rate of ten ms
99
99.995
97
Y = 0
14
+
-
Tm AT wheels
2

FIG.4

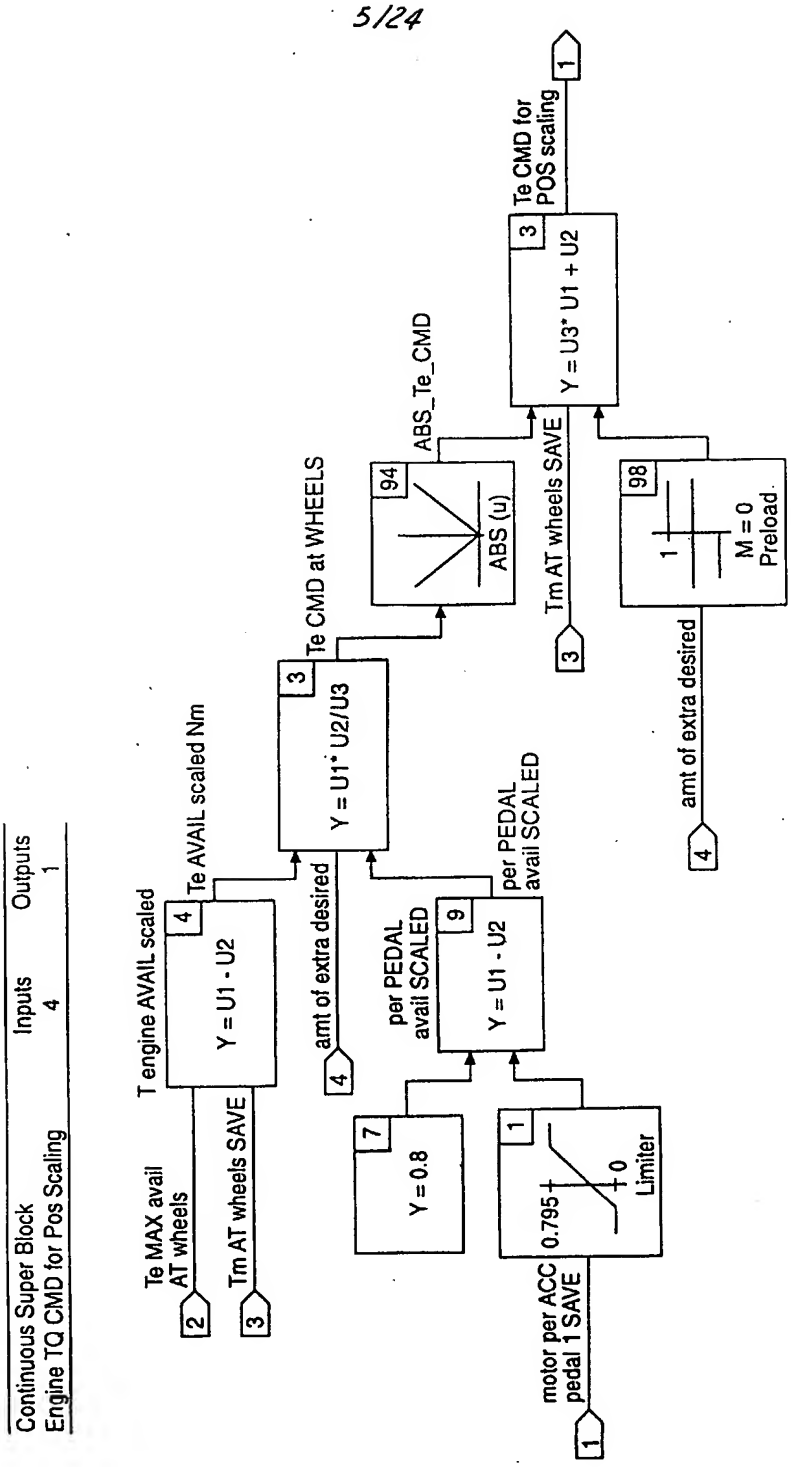
Continuous Super Block
Engine TQ CMD for Pos Scaling
Inputs 4
Outputs 1
Te MAX avail AT wheels
2
Tm AT wheels SAVE
3
T engine AVAIL scaled
4
Y = U1 - U2
Te AVAIL scaled Nm
amt of extra desired
4
3
Y = U1* U2/U3
Te CMD at WHEELS
7
Y = 0.8
per PEDAL avail SCALED
9
Y = U1 - U2
per PEDAL avail SCALED
1
0.795
0
Limiter
motor per ACC pedal 1 SAVE
1
94
ABS (u)
ABS_Te_CMD
3
Tm AT wheels SAVE
3
Y = U3* U1 + U2
Te CMD for POS scaling
1
98
1
M = 0
Preload
amt of extra desired
4

FIG.5

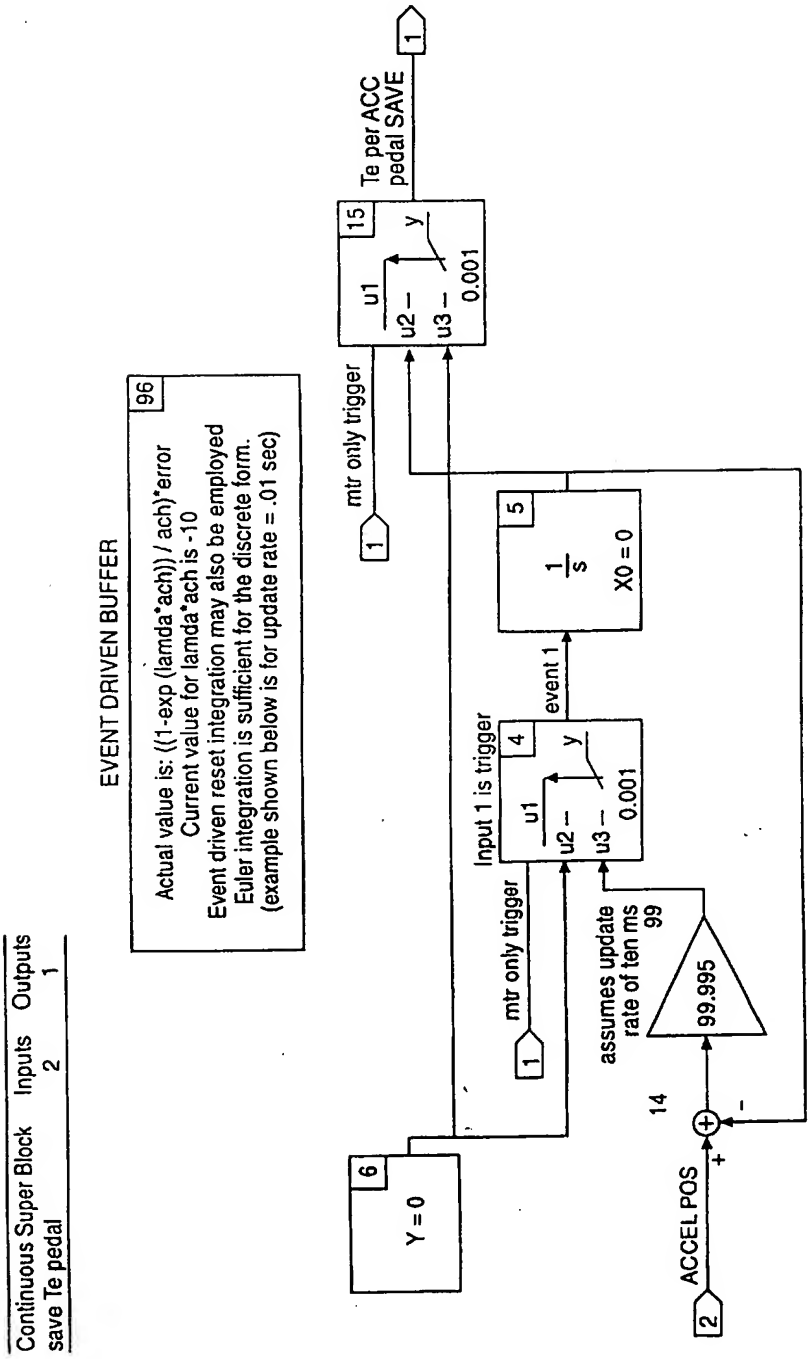
Continuous Super Block Inputs Outputs
save Te pedal 2 1
EVENT DRIVEN BUFFER
96
Actual value is: ((1-exp (lamda*ach)) / ach)*error
Current value for lamda*ach is -10
Event driven reset integration may also be employed
Euler integration is sufficient for the discrete form.
(example shown below is for update rate = .01 sec)
Te per ACC pedal SAVE
15
u1
u2 –
u3 –
y
0.001
mtr only trigger
Input 1 is trigger
4
5
1/s
X0 = 0
event 1
6
Y = 0
assumes update rate of ten ms
99
99.995
14
ACCEL POS
2

FIG.6

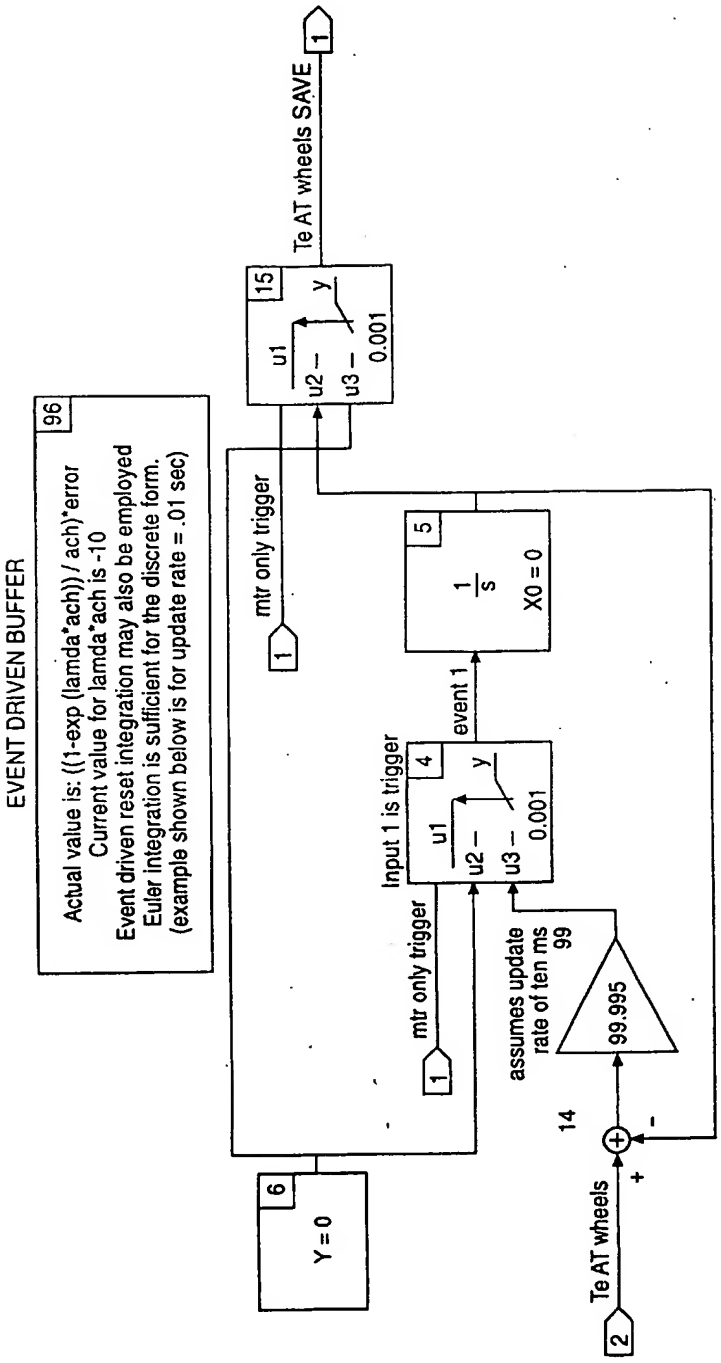
EVENT DRIVEN BUFFER
96
Actual value is: ((1-exp (lamda*ach)) / ach)*error
Current value for lamda*ach is -10
Event driven reset integration may also be employed
Euler integration is sufficient for the discrete form.
(example shown below is for update rate = .01 sec)
Te AT wheels SAVE
1
15
u1
u2 –
u3 –
y
0.001
mtr only trigger
1
5
1/s
X0 = 0
event 1
Input 1 is trigger
4
u1
u2 –
u3 –
y
0.001
mtr only trigger
1
assumes update rate of ten ms
99
99.995
14
+
-
Te AT wheels
2
6
Y = 0

FIG.7

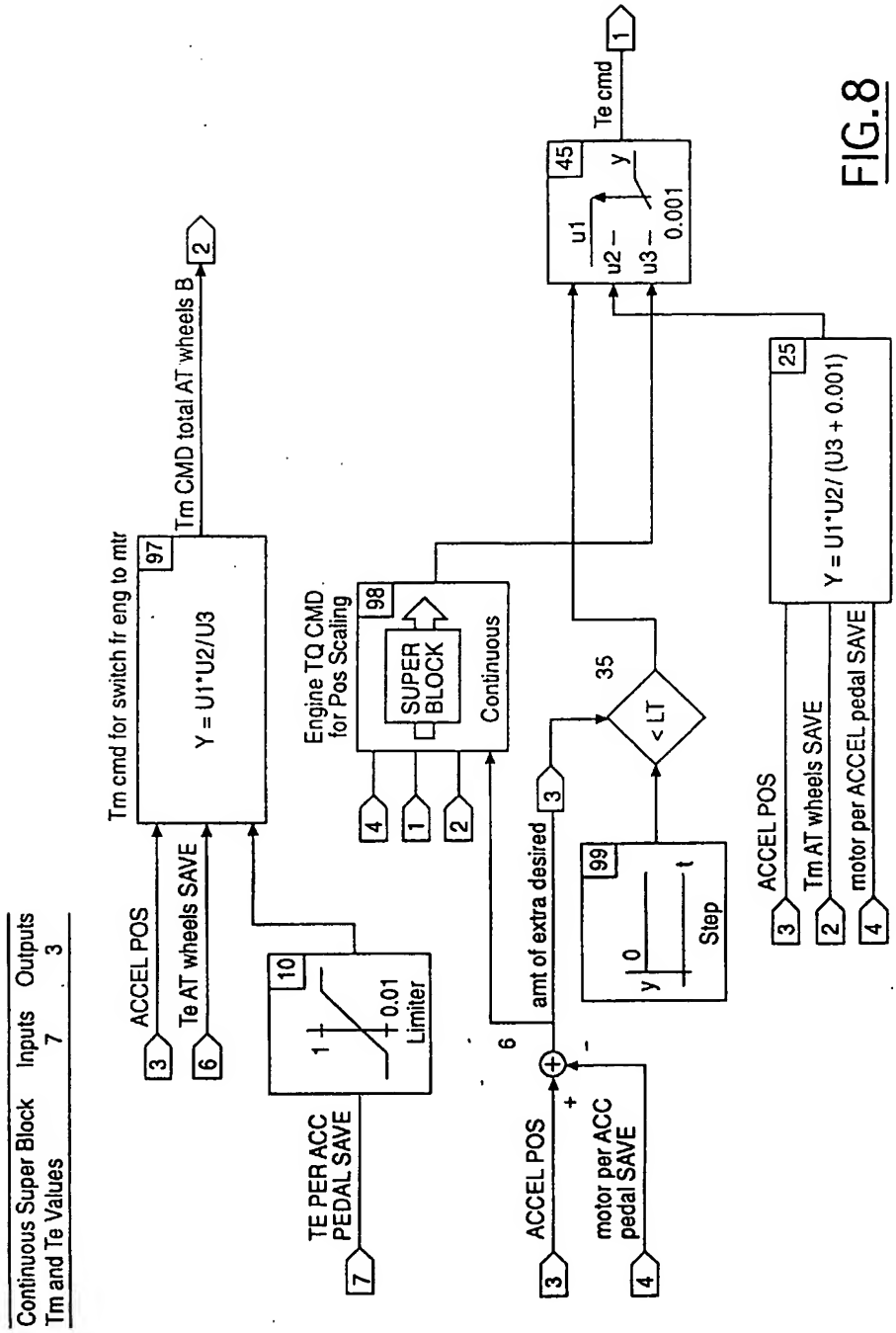
Continuous Super Block Inputs Outputs
Tm and Te Values 7 3
ACCEL POS
Te AT wheels SAVE
Tm cmd for switch fr eng to mtr
97
Y = U1*U2/U3
Tm CMD total AT wheels B
2
10
1
0.01
Limiter
TE PER ACC PEDAL SAVE
7
Engine TQ CMD for Pos Scaling
98
SUPER BLOCK
Continuous
4
1
2
6
amt of extra desired
3
ACCEL POS
motor per ACC pedal SAVE
4
35
< LT
99
0
Step
45
u1
u2
u3
0.001
y
Te cmd
1
ACCEL POS
Tm AT wheels SAVE
motor per ACCEL pedal SAVE
25
Y = U1*U2/ (U3 + 0.001)

FIG.8

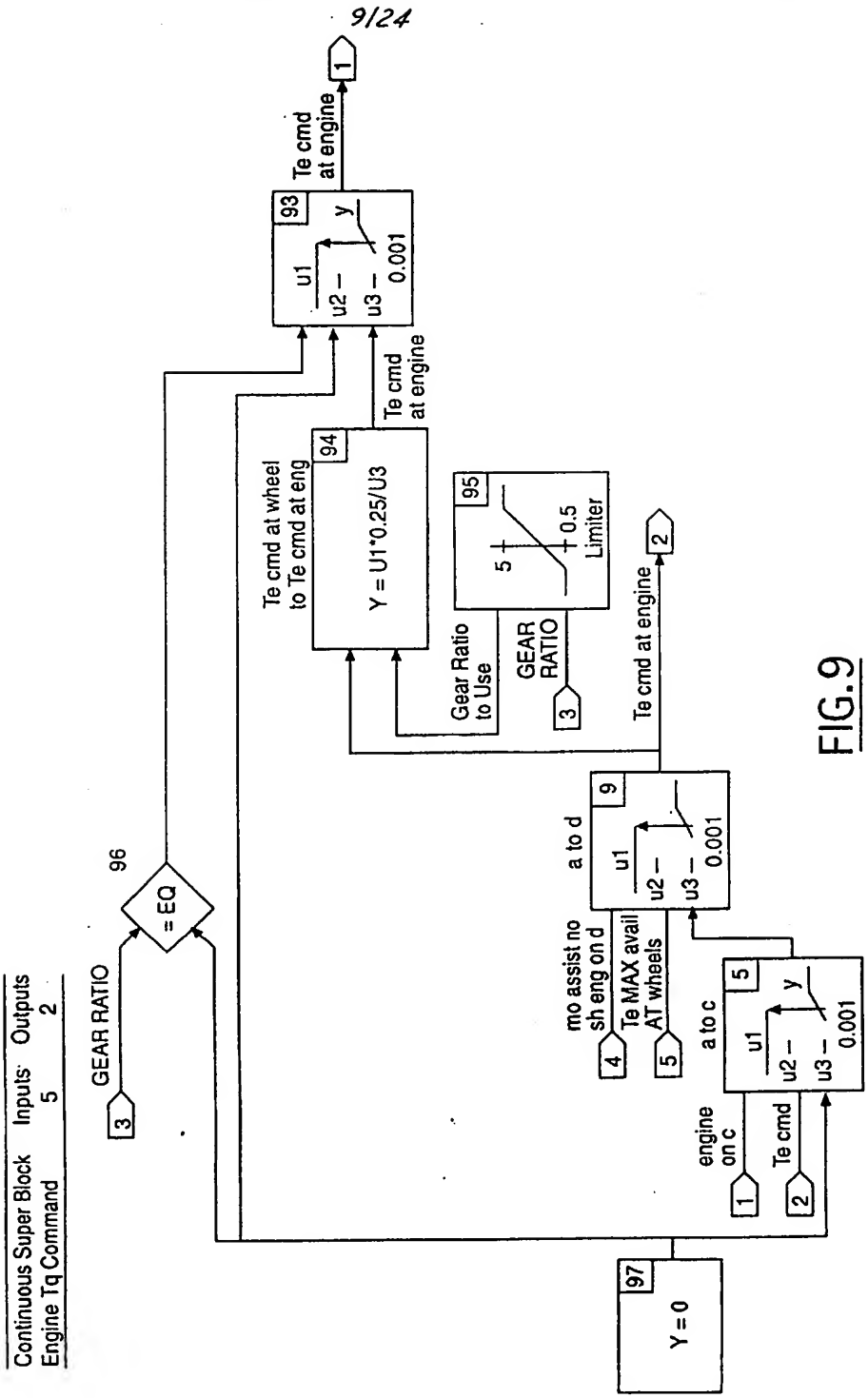
Continuous Super Block Inputs 5 Outputs 2
Engine Tq Command
GEAR RATIO
3
96
= EQ
Te cmd at engine
1
93
u1
u2 –
u3 –
y
0.001
Te cmd at engine
Te cmd at wheel to Te cmd at eng
94
Y = U1*0.25/U3
95
5
0.5
Limiter
Gear Ratio to Use
GEAR RATIO
3
Te cmd at engine
2
a to d
9
mo assist no sh eng on d
4
Te MAX avail AT wheels
5
a to c
5
engine on c
1
Te cmd
2
97
Y = 0

FIG.9

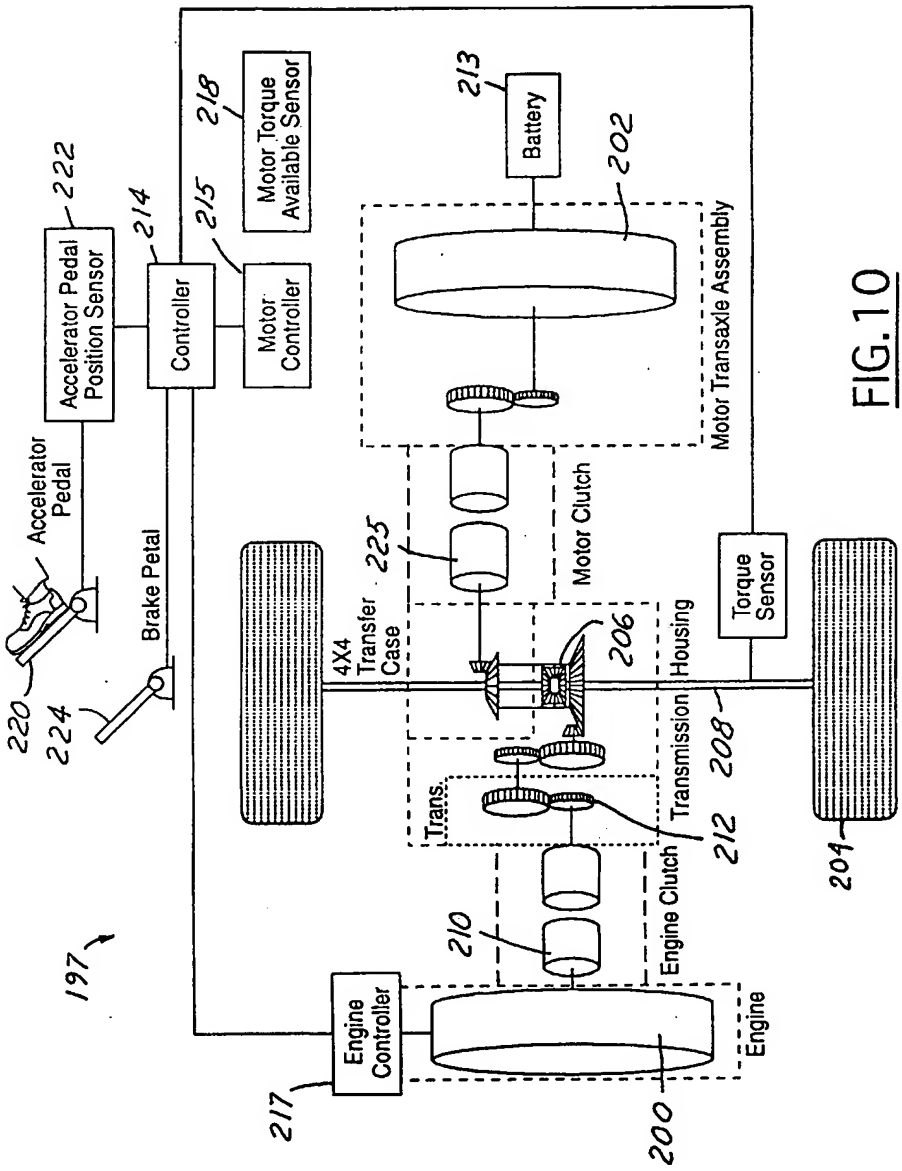
Motor Torque Available Sensor
218
213
Battery
202
222
214
215
Accelerator Pedal Position Sensor
Controller
Motor Controller
Motor Transaxle Assembly
Accelerator Pedal
Brake Petal
225
Motor Clutch
Torque Sensor
4X4 Transfer Case
206
Housing
Trans.
Transmission
208
212
204
220
224
197
210
Engine Clutch
Engine Controller
Engine
217
200

FIG.10

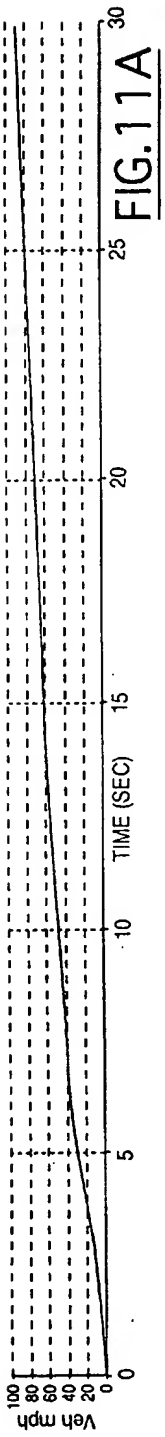

FIG.11A

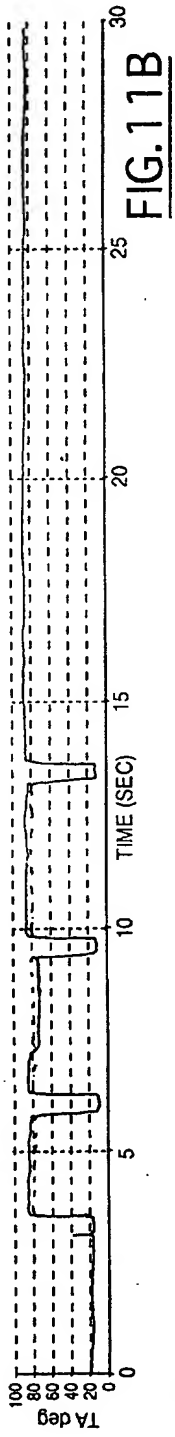

FIG.11B

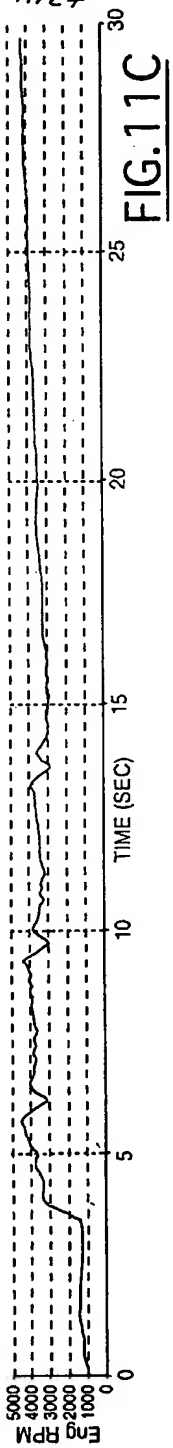

FIG.11C

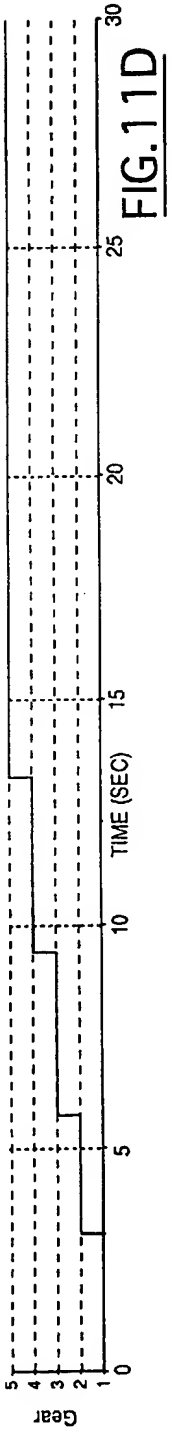

FIG.11D

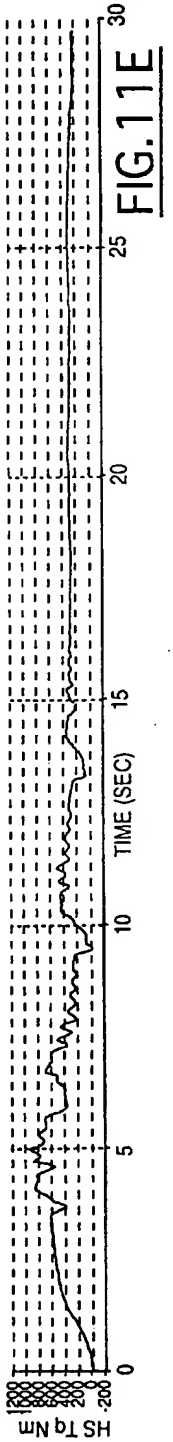

FIG.11E

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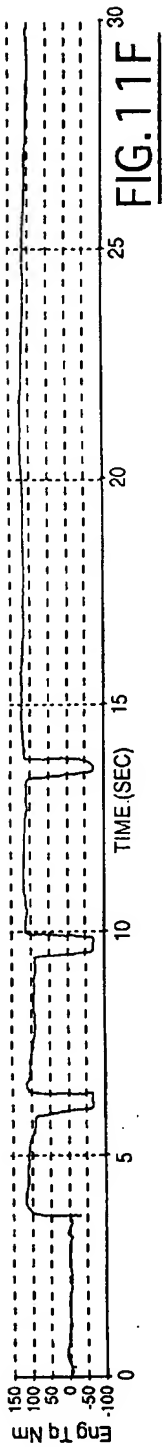

FIG. 11F

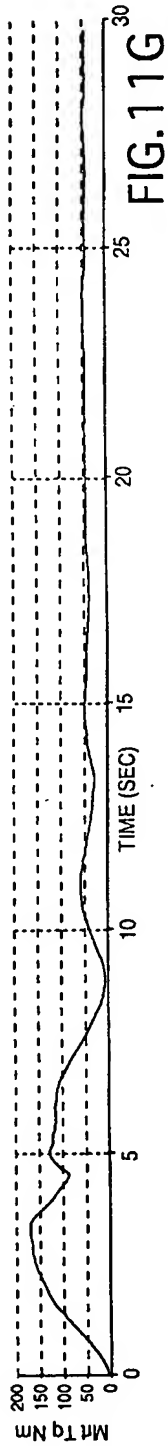

FIG. 11G

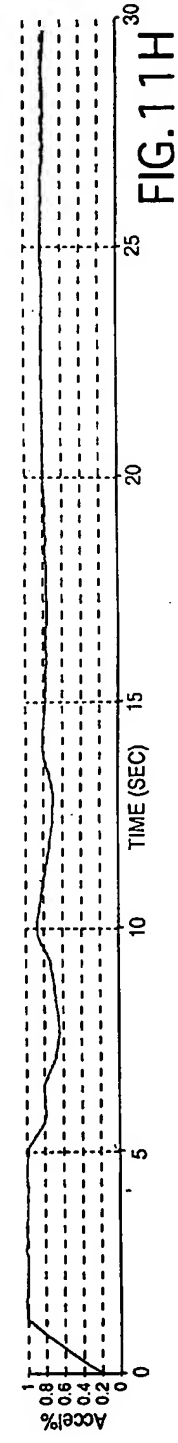

FIG. 11H

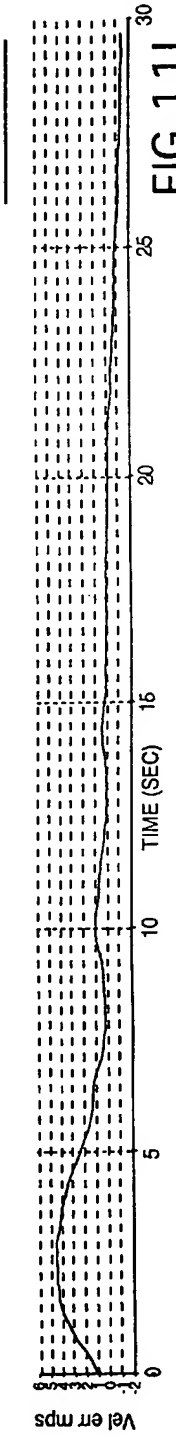

FIG. 11I

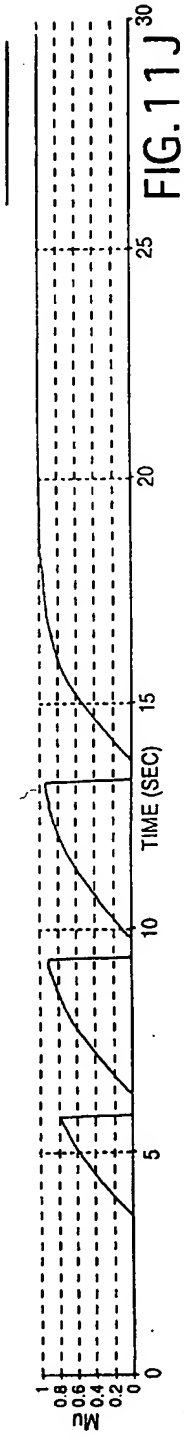

FIG. 11J

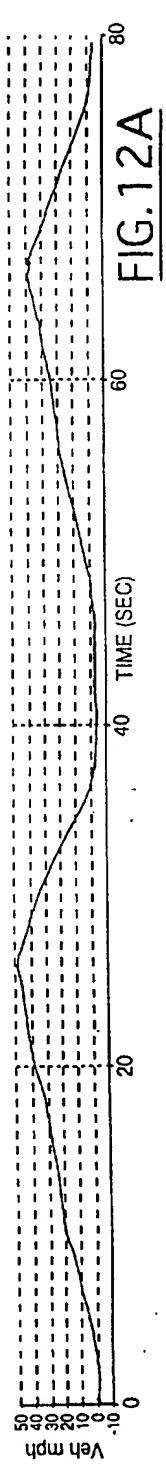

FIG.12A

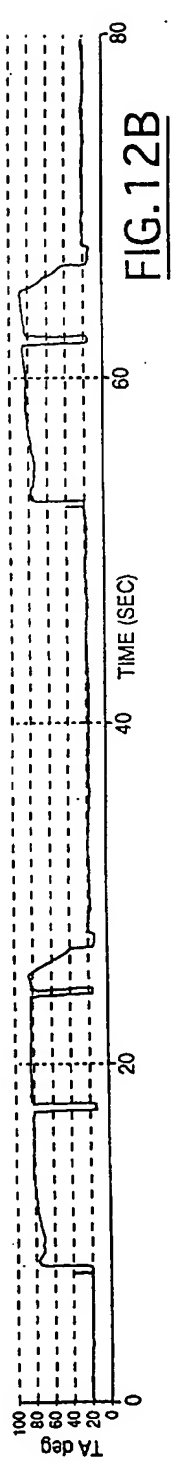

FIG.12B

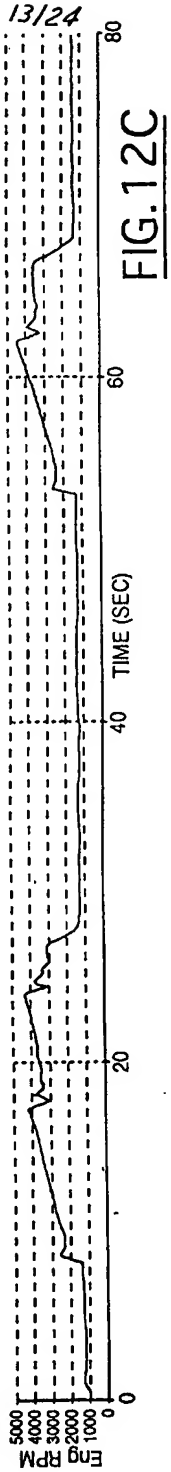

FIG.12C

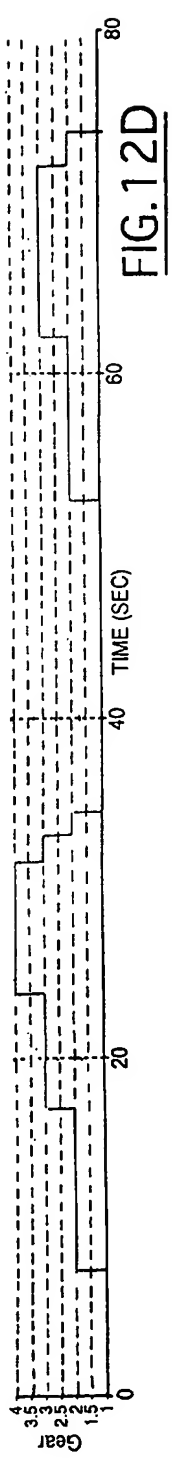

FIG.12D

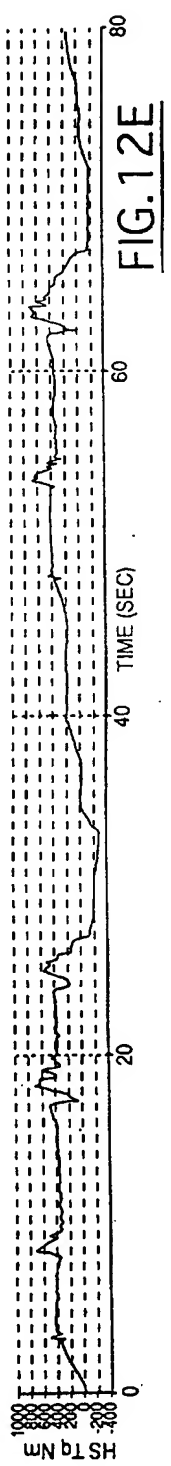

FIG.12E

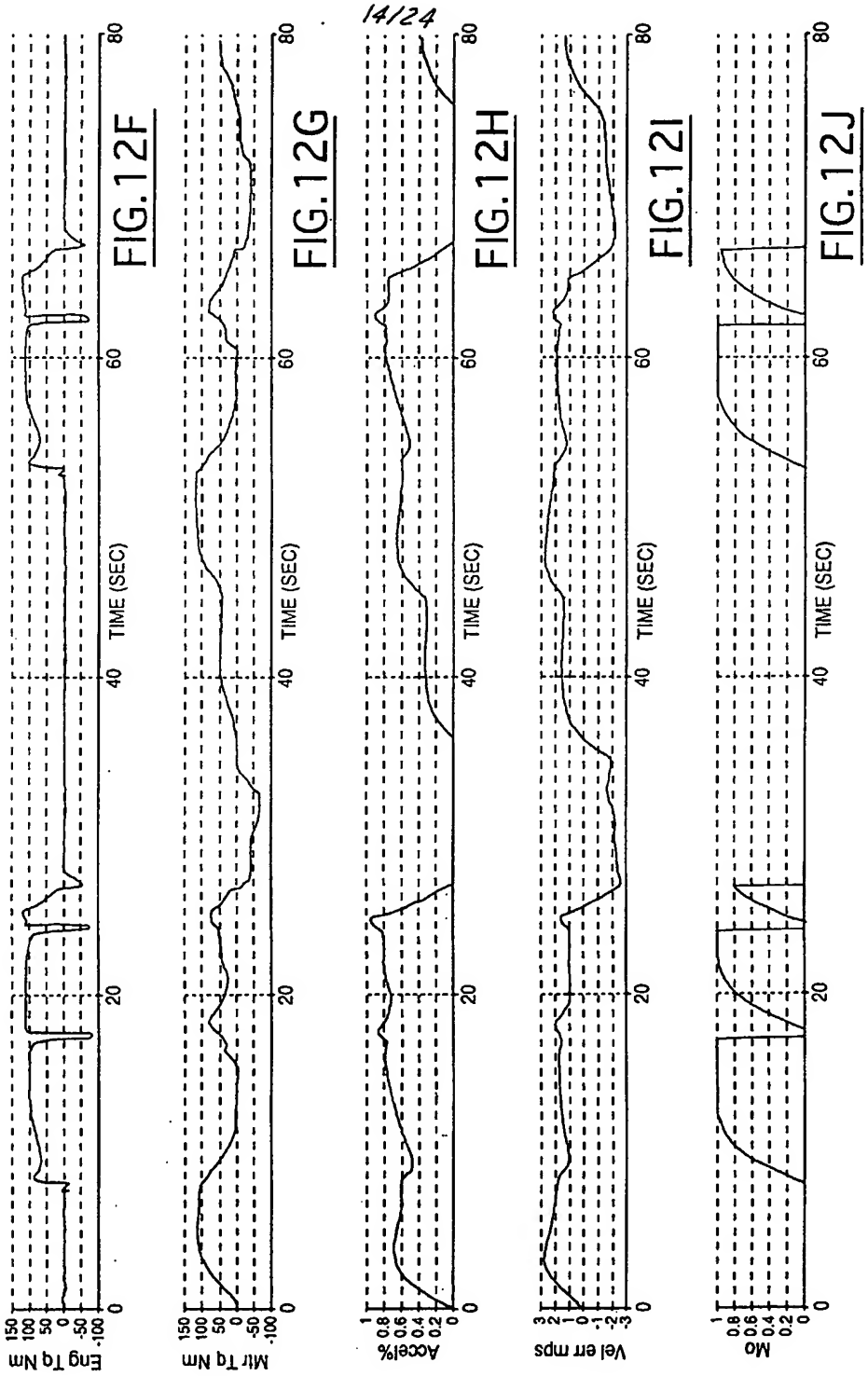

FIG.12F

FIG.12G

FIG.12H

FIG.12I

FIG.12J

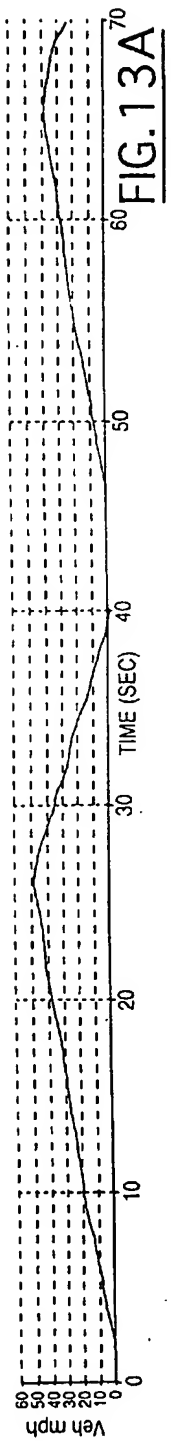

FIG. 13A

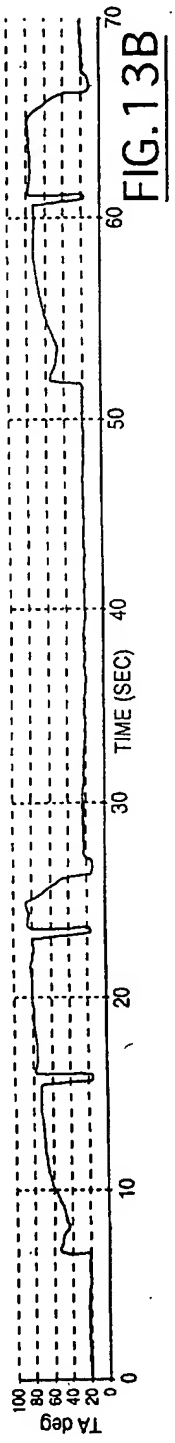

FIG. 13B

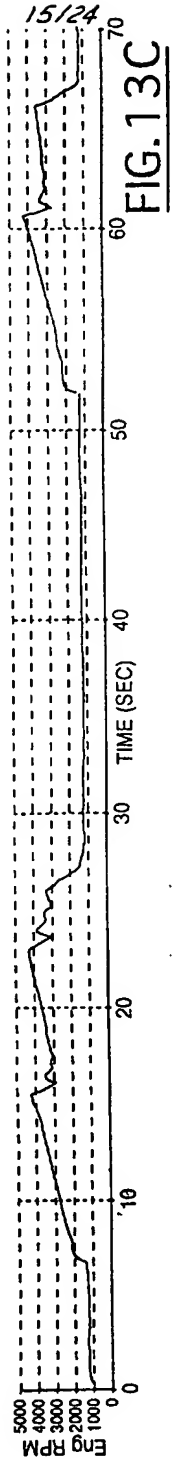

FIG. 13C

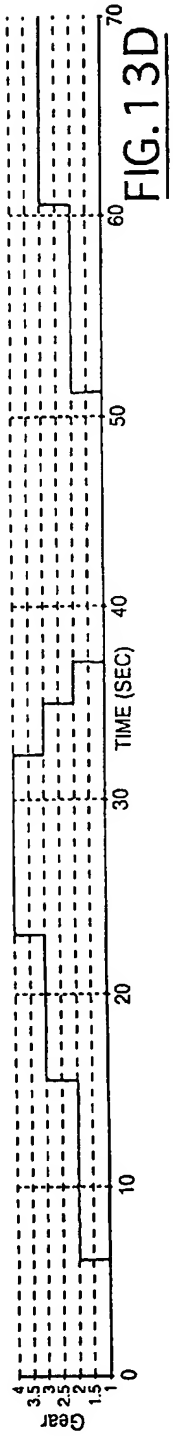

FIG. 13D

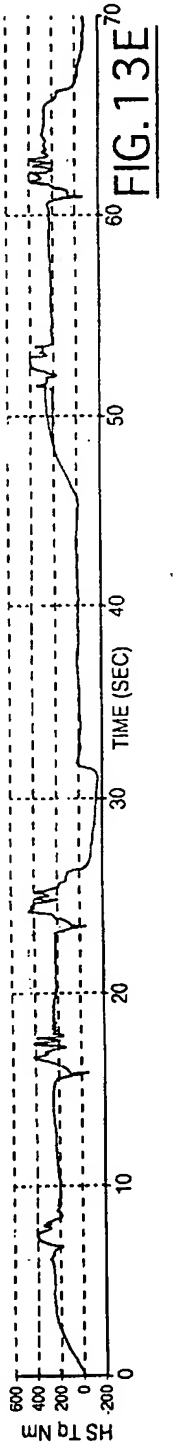

FIG. 13E

20030203.0830 US 10063188

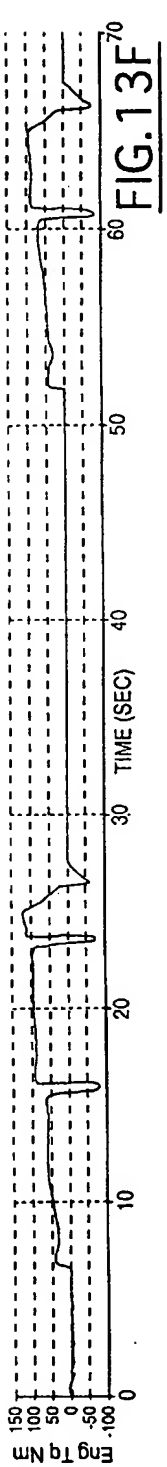

FIG. 13F

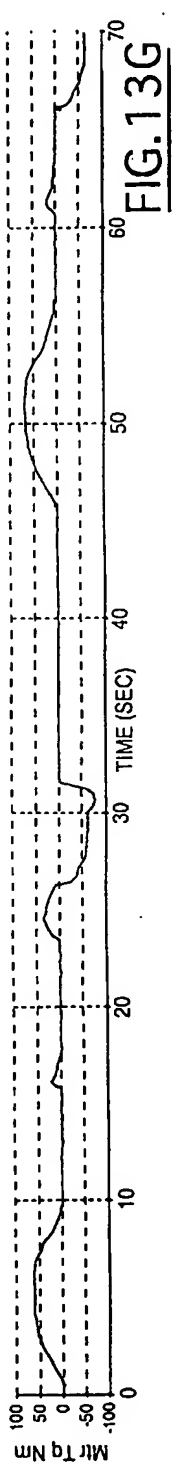

FIG. 13G

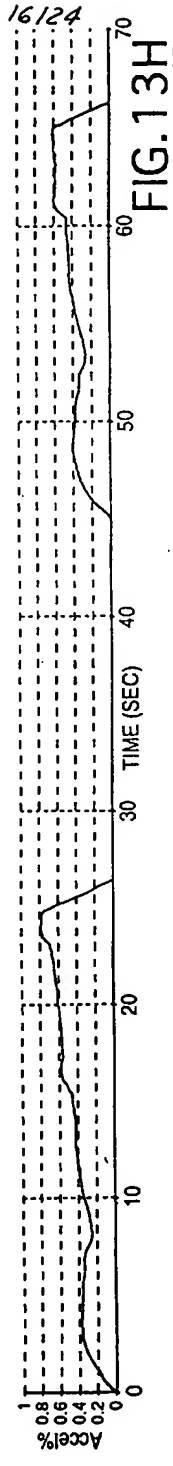

FIG. 13H

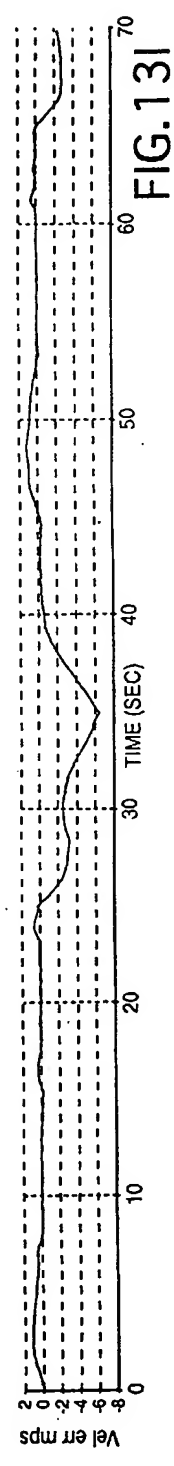

FIG. 13I

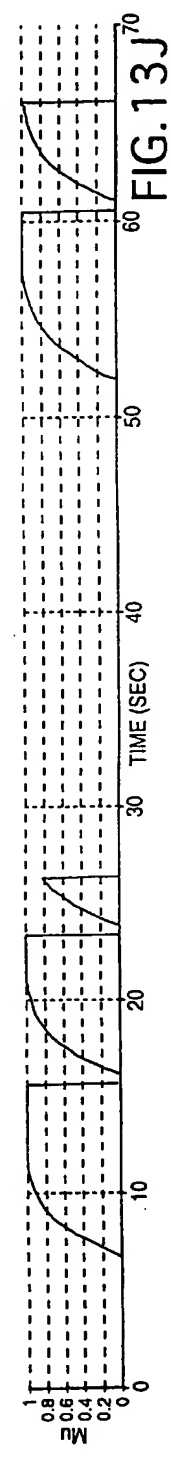

FIG. 13J

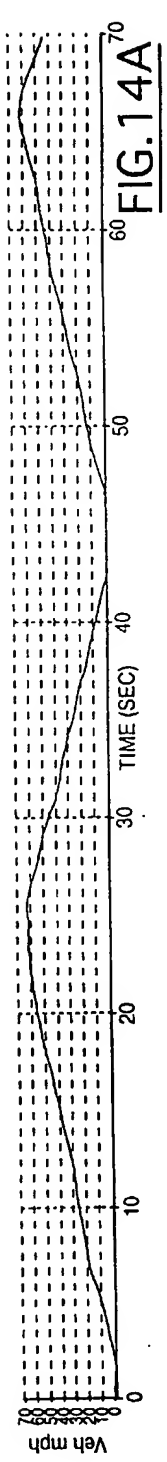

FIG. 14A

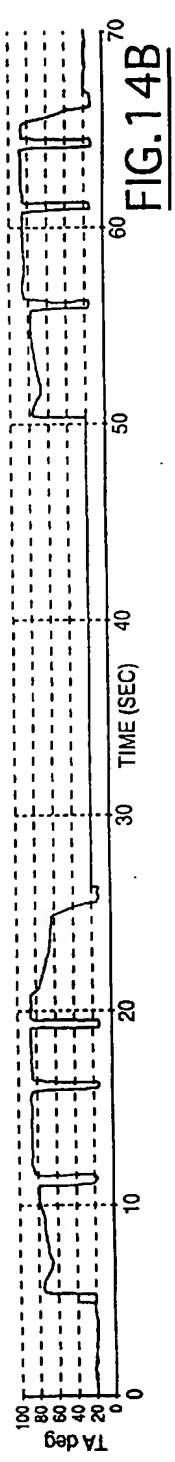

FIG. 14B

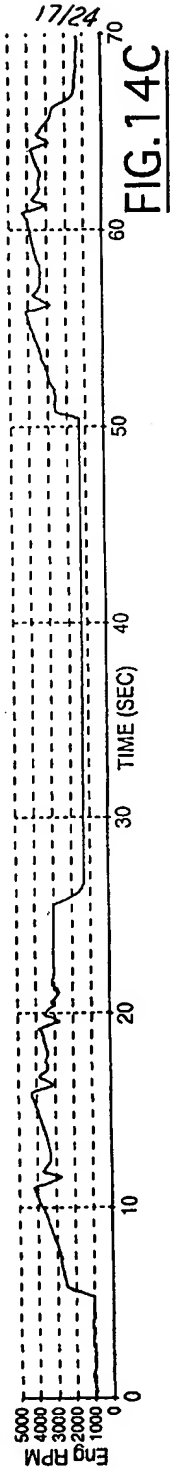

FIG. 14C

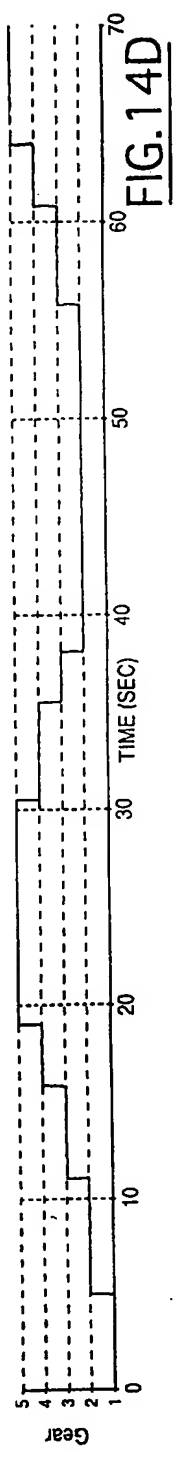

FIG. 14D

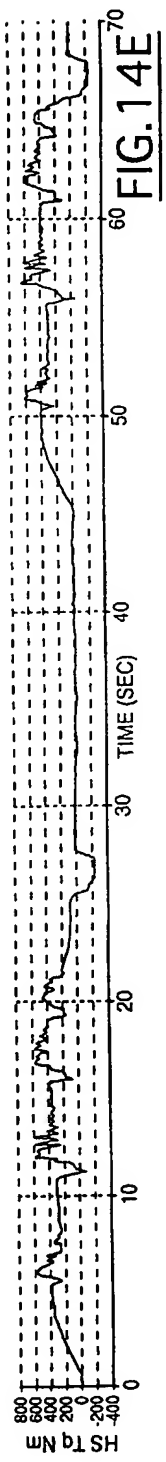

FIG. 14E

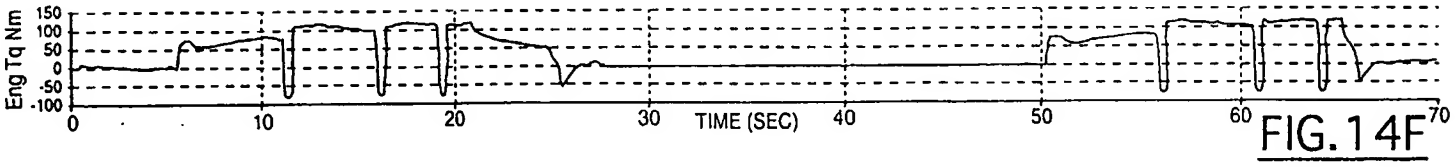

FIG. 14F

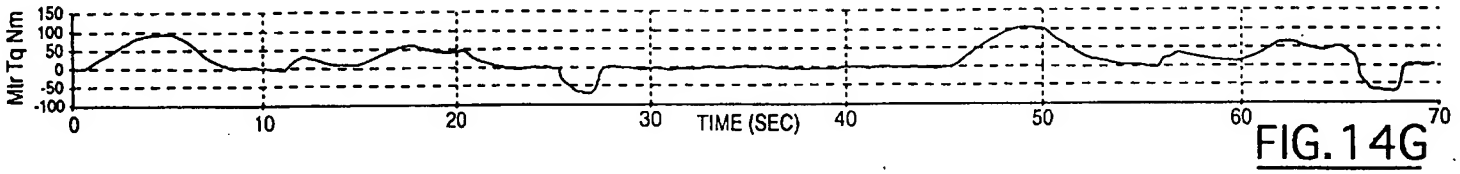

FIG. 14G

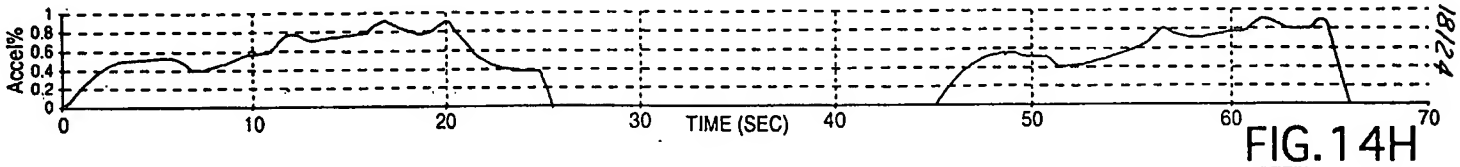

FIG. 14H

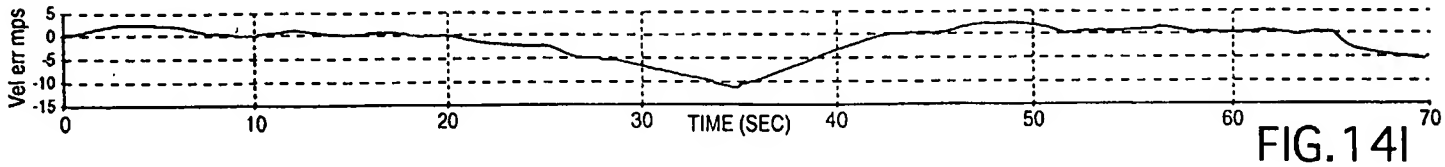

FIG. 14I

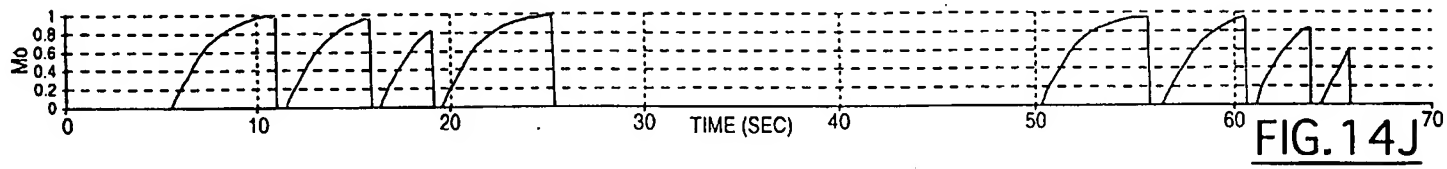

FIG. 14J

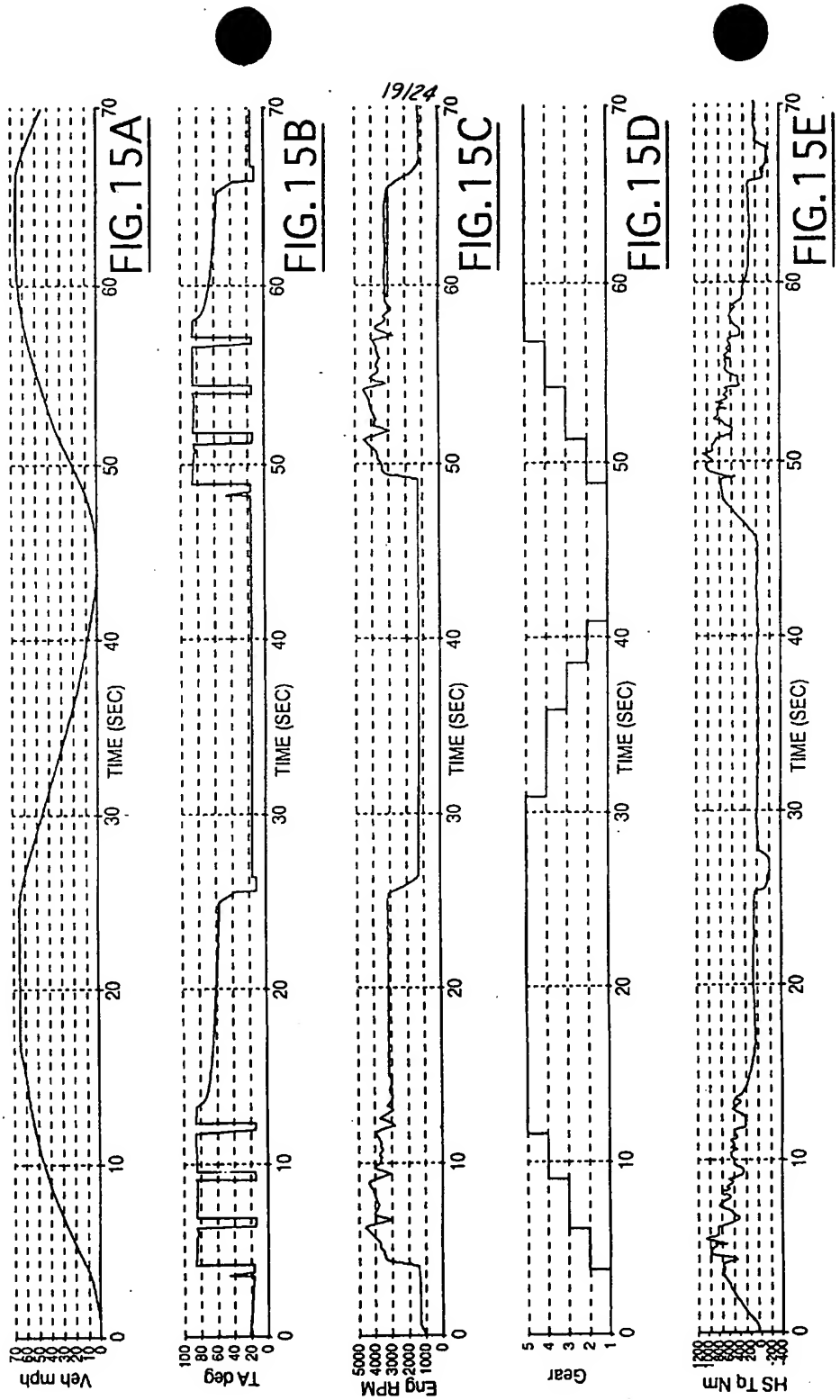

FIG.15A

FIG.15B

FIG.15C

FIG.15D

FIG.15E

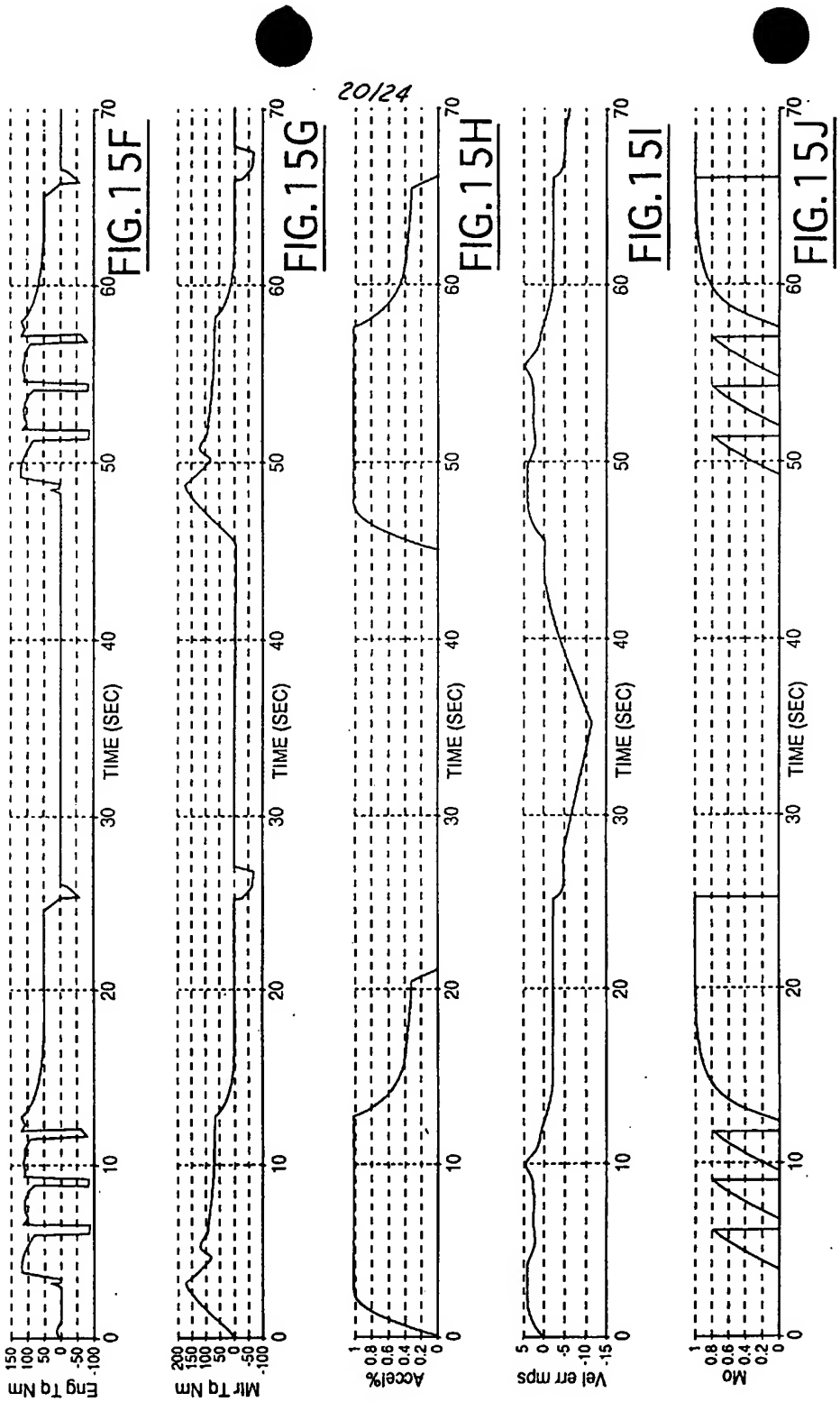

FIG. 15F

FIG. 15G

FIG. 15H

FIG. 15I

FIG. 15J

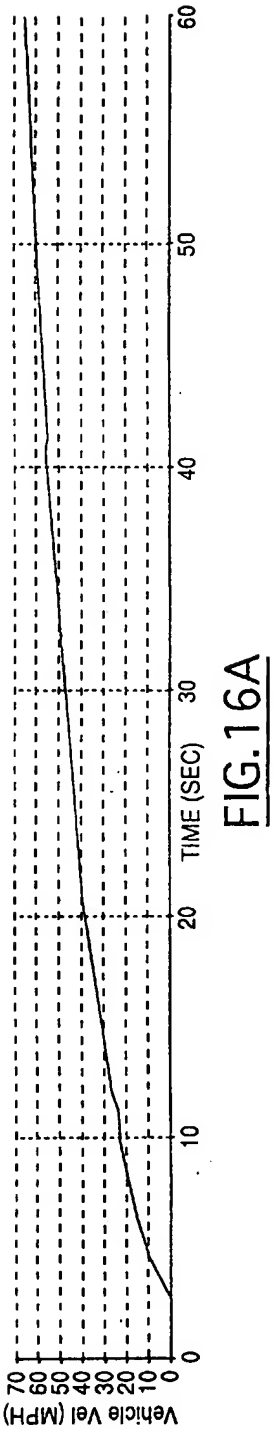

FIG.16A

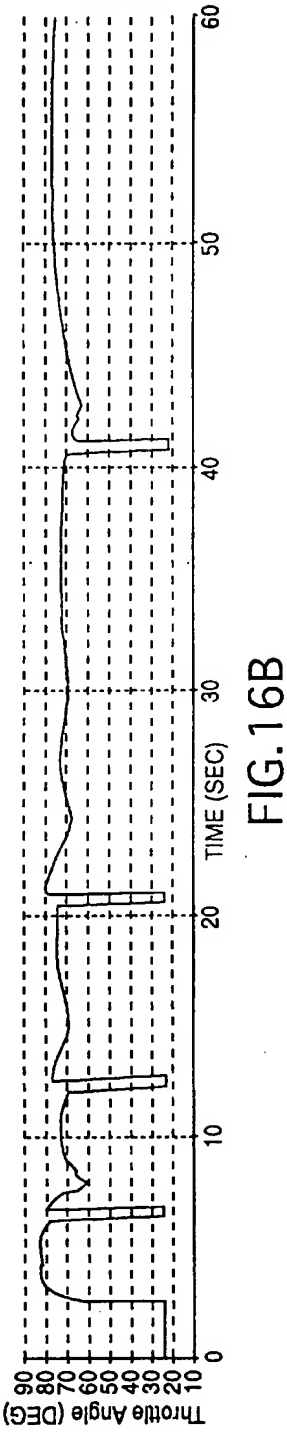

FIG.16B

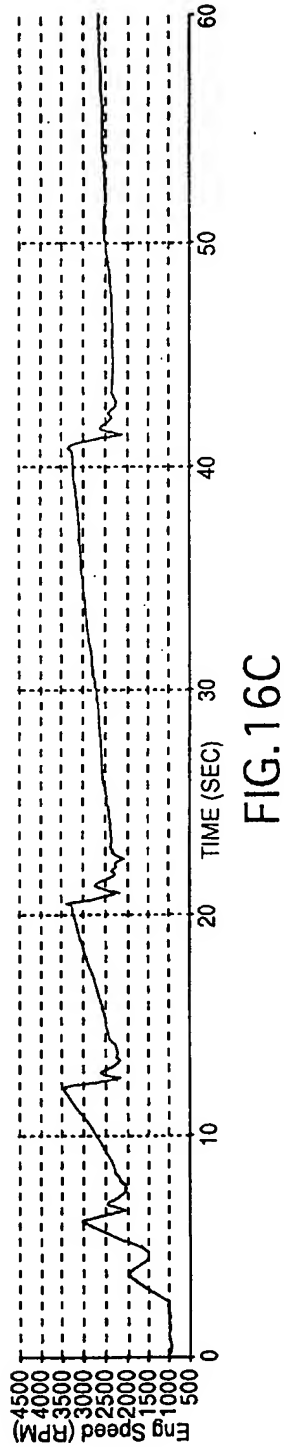

FIG.16C

22124

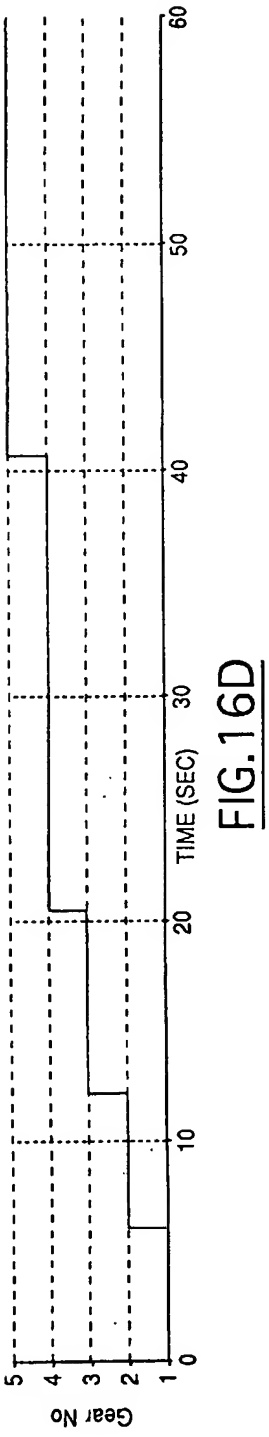

FIG.16D

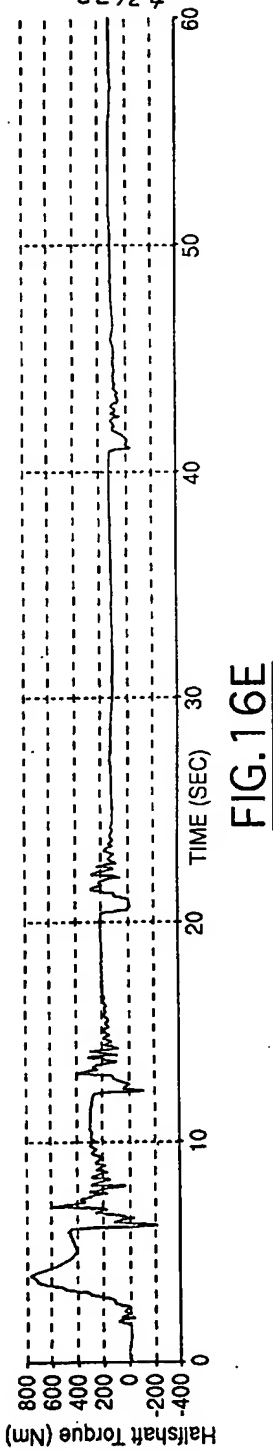

FIG.16E

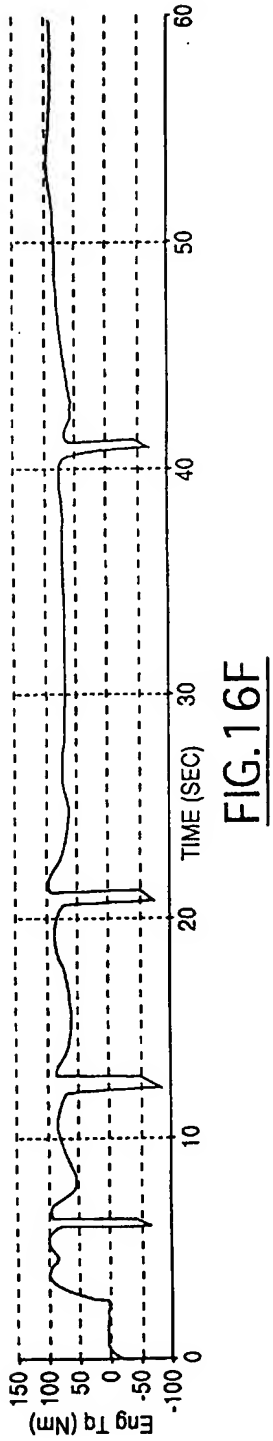

FIG.16F

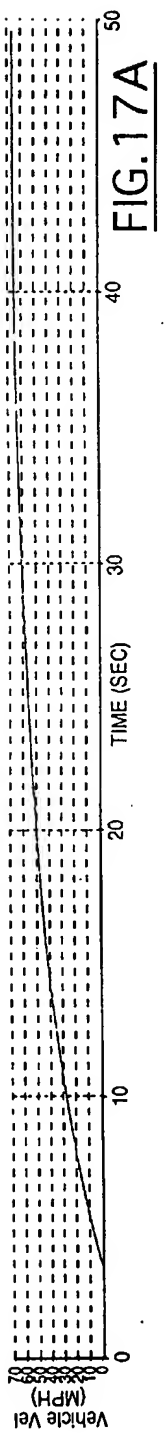

FIG.17A

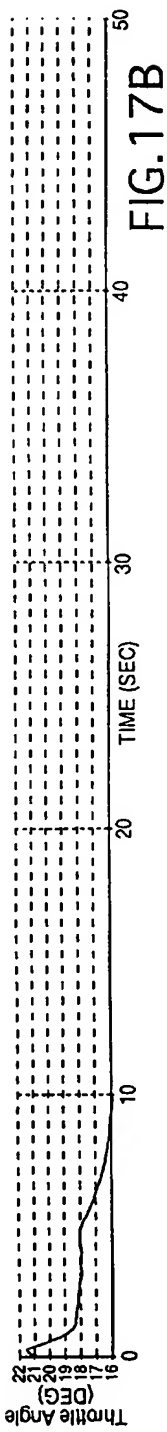

FIG.17B

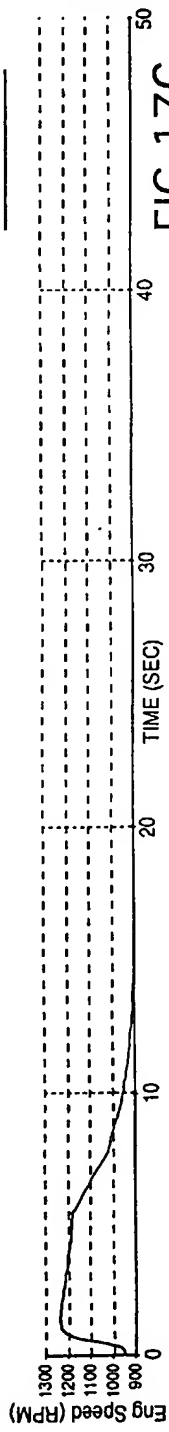

FIG.17C

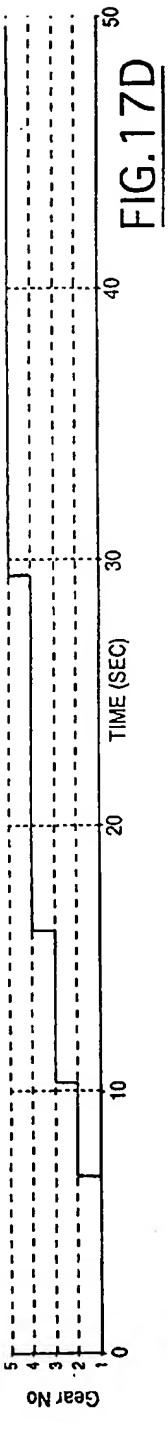

FIG.17D

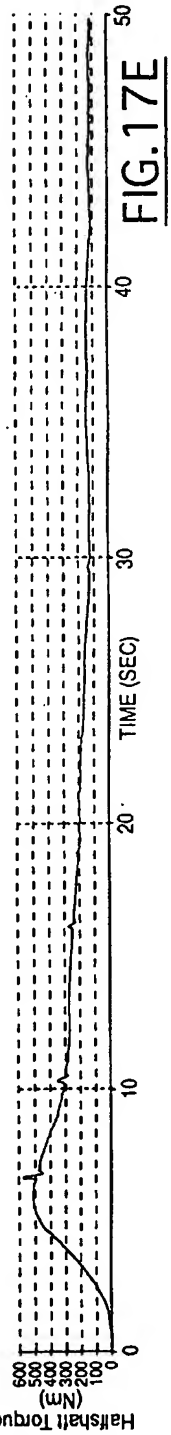

FIG.17E

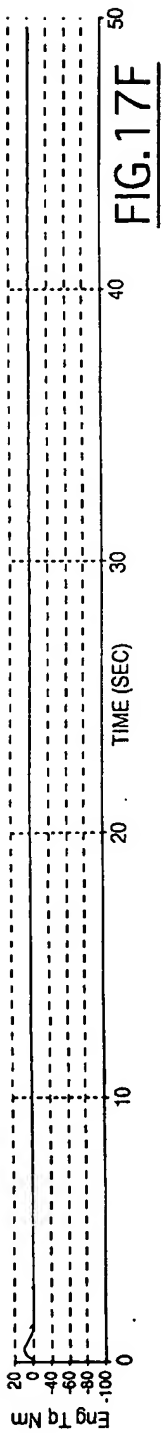

FIG.17F

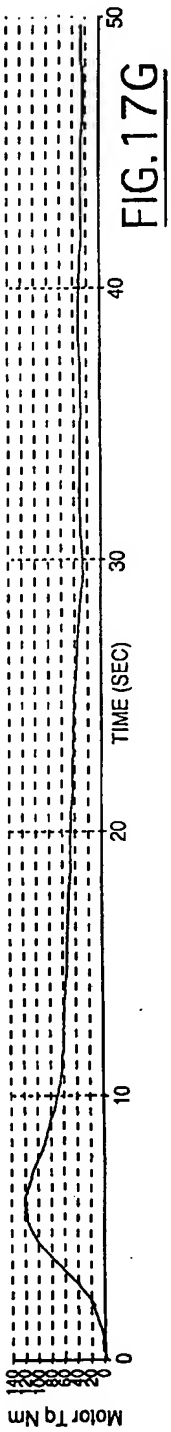

FIG.17G

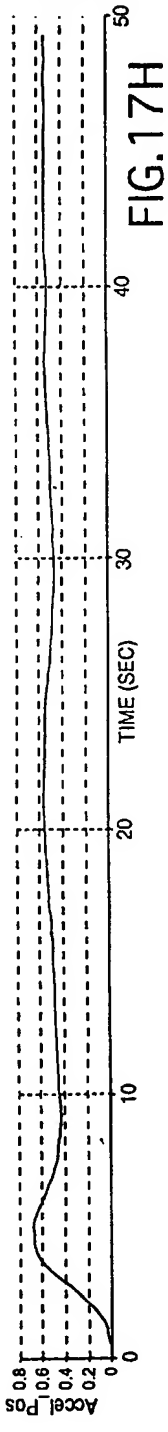

FIG.17H

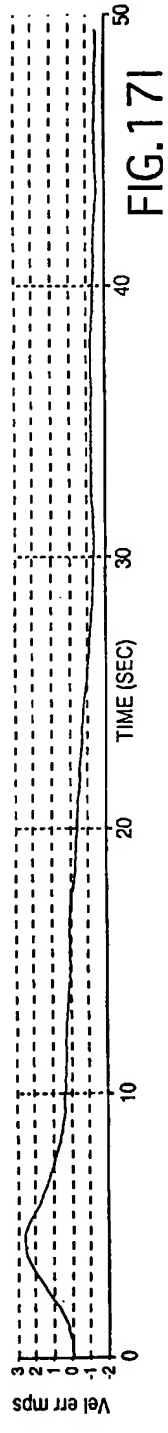

FIG.17I

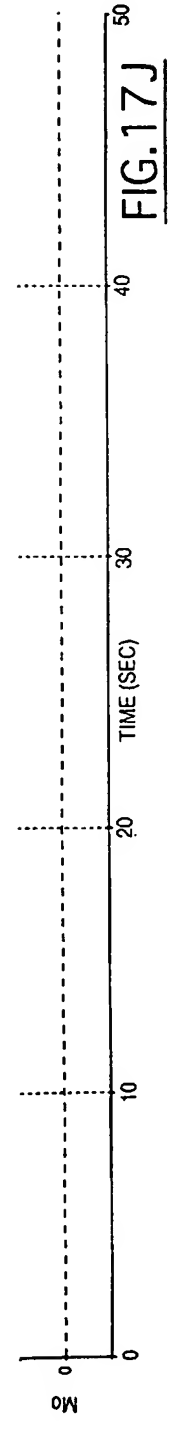

FIG.17J